WILDROSE CHARCOAL KILNS

By Robert J. Murphy
Former Superintendent
Death Valley National Monument

KEEPSAKE NO. 12
published for the
23rd DEATH VALLEY '49ers ENCAMPMENT
Death Valley, California
November 9, 10, 11, 12, 1972

DEATH VALLEY '49ers PRESIDENTS

1949—Andy W. Noon*
1950, 51—John Anson Ford
1952—Ardis Manly Walker
1953—Paul Palmer*
1954—George W. Savage*
1955—Dr. Thomas Clements
1956—Mrs. Willard (Peg) Lewis
1957—L. Burr Belden
1958—Alex Krater
1959—H. Harold Ihrig
1960—Ralph Palmer Merritt*
1961—George H. Sturtevant
1962—Charles A. Scholl*
1963—Ralph A. Fear
1964—Arthur W. Walker*
1965—Hugh Tolford
1966—Mrs. R. R. (Hazel) Henderson
1967—Leo S. Moore
1968—Edward P. Jones
1969—J. Emil Morhardt
1970—Tom Mathew
1971—Paul DeDecker

*deceased.

Death Valley '49ers, Inc.
Death Valley, California

WILDROSE CHARCOAL KILNS

By Robert J. Murphy
Former Superintendent
Death Valley National Monument

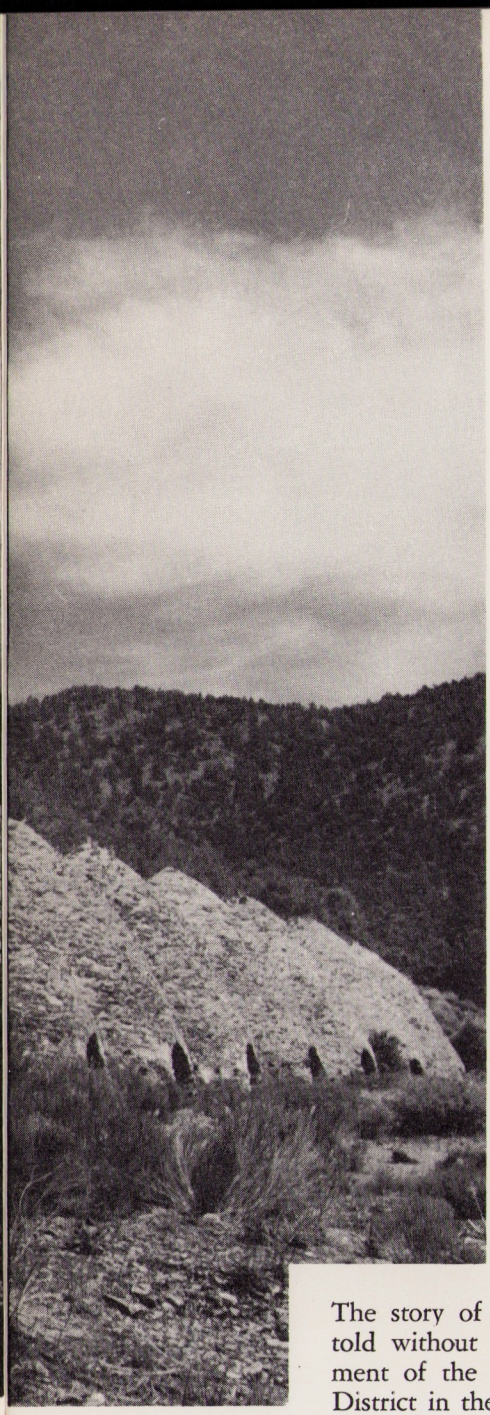
KEEPSAKE NO. 12

published for the
23rd DEATH VALLEY '49ers ENCAMPMENT
Death Valley, California
November 9, 10, 11, 12, 1972

1872 A CENTENNIAL YEAR 1972

THE NATIONAL PARK SERVICE U.S. BORAX COMPANY

Copyright 1972
by
Death Valley '49ers, Inc.
Death Valley, California



WILDROSE CHARCOAL KILNS

The story of the Wildrose Charcoal Kilns cannot be told without also relating the discovery and development of the Modoc and other mines of the Lookout District in the Argus Range, on the west side of Panamint Valley. Both tales are inextricably interwoven.

Also intertwined are the names of persons, some well known; others almost lost in obscurity. Vital too, to the understanding of the need for charcoal, is an insight into the metal ores and the smelting process.

The air within each kiln is still pungent with the odor of resin and creosote, the by-products of the burning process.

The second wave of pioneers to Death Valley followed the heroic '49ers about ten years later. We are all familiar with the legend of the Lost Gunsight lode, reportedly found by one of the bands of argonauts, the "Mississippi Boys".

By the 1860s prospectors began to comb the desert ranges. After the close of the Civil War in 1865, hordes came to stake their claims to fortune. They spoke in a new vocabulary of place names. For example: the Panamint Range was named only five years earlier by members of the Darwin French prospecting expedition in 1860.

By 1873 a mining camp in the Panamints, which took its name from that range, began shipping 750 pound silver ingots from its smelter.

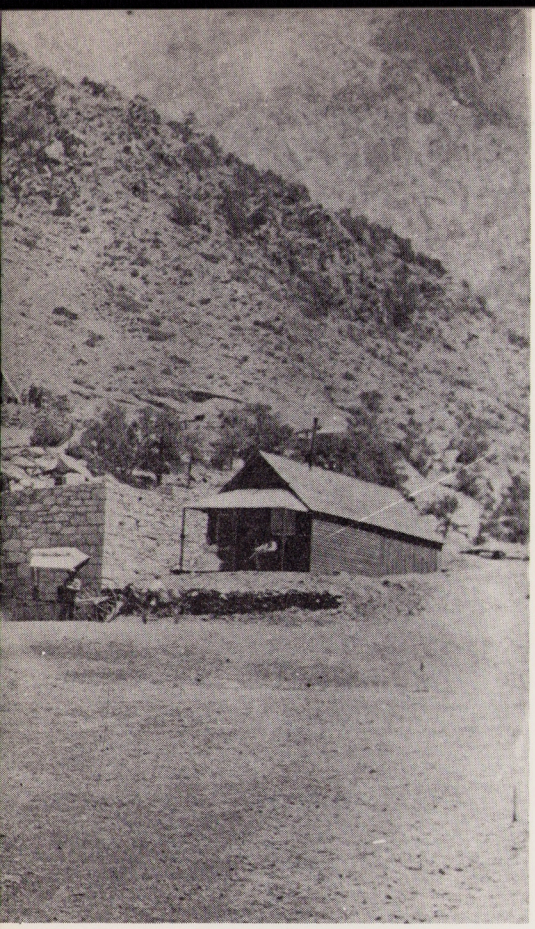
Few structures from this period remain within the boundaries of Death Valley National Monument. But among these are ten of the best preserved structures in the region. They rank also among the least known. I speak, of course, of the Wildrose Charcoal Kilns which date from this early exploratory period in Death Valley's history.

In our search for the facts by which to illuminate our past, we most commonly dwell upon the most spectacular events. When thinking about mining and prospecting, our minds become fixed upon minerals, especially the base metals — gold and silver. So it was in this period. Pages are filled with references to ledges of silver and man's efforts to win that prize. But to the mining engineer or mill operator, the finding of a valuable metal ore is just the beginning. With gold as an exception, few metals are found native, that is, in a pure usable form. It is the rule rather than the exception that metallic minerals are found in nature in combination

with other chemical elements. To extract the metal, ores must be treated and processed to remove the unwanted elements and reduce the ore to its simplest state—a metal. Silver is a good example. Most of the minerals containing silver also contain sulfur. To separate the precious metal, a pure form of carbon is required. So is a source of intense heat.

Coal, especially coking coal, occurs nowhere in the region. For that reason, the mining engineer was forced to turn to a nearby source of carbon and a hot burning fuel. The only source of fuel in or near the desert ranges lay in the forests of pinyon and juniper. But wood does not supply either requirement of burning with great heat or does it in itself contain elemental carbon—carbon in the pure state. However, by the simple conversion of wood into charcoal both demands are met. It follows that the charcoal kilns played a vital role in the mining picture.

In 1875 rich deposits of lead ore were discovered in the area in and around the Argus Range on the west side of Panamint Valley. Assay reports revealed a high percentage of silver—101 to 293 ounces per ton of ore. The ores were galena and argentite,



The store of Joseph S. Birchett on the Main Street of Lookout, California was probably photographed sometime between 1877 and 1879.

both containing sulfur in chemical association with lead and silver, respectively. The ores were mined from fracture zones in limestone rocks which had been altered to white marble. Gold was also present in commercial quantity.

Following the 1875 strike, the Modoc (spelled M-o-d-o-c) district came into being. The principal mine carried the same name. Its operator was the Modock (spelled M-o-d-o-c-k) Consolidated Mining Company. The community which served this mining complex was Lookout on the top of Lookout Mountain.

Just a year after the big discovery, the May 1876 *Kern County Courier* wrote "that new and much talked of mining district in our backcountry . . . . In Lookout District, 10 miles east of Darwin, the Modoc Company has found an immense body of first class ore, and will soon have a furnace or mill erected . . . . "

With the discovery and development of additional mines in the district the region became known as the Lookout District. Other Modock Consolidated mines producing similar lead-silver ores were the Confidence, Eclipse, and the Kentuckian, later the Minnietta. A report of the U. S. Bureau of Mines indicated that total

The product from the rock charcoal kilns of Wildrose Canyon was hauled by Remi Nadeau's mule teams across Panamint Valley for the smelters that serviced the Minnietta and Modoc mines located in the Argus Range.

production during the period 1875 through 1890 amounted to one million nine hundred thousand dollars from the Modoc mine alone.

The charcoal kilns were constructed to manufacture charcoal for two smelters. Undoubtedly some of the coal was used to fire steam boilers which supplied power to operate a stamp mill.

Mr. J. A. Crossman of the California Bureau of Mines reported in October, 1876 that "the 60-ton furnaces are ready to start up. The company has excellent boarding houses, blacksmith shops, etc., which are perfect in all their appointments." The com-

pany town, of course, was Lookout. Things were in a state of boom. The *Coso Mining News* reported that the mines were inspected by engineers on hand to witness the first firing of the furnaces and in the opinion of mine superintendent Barber, "the furnace is working charmingly." Production was quoted as running five bars per hour. The bars averaged 90 pounds each and assayed between $400 and $500.

Among the mining engineers who inspected the new furnaces was George Hearst. One of the intriguing facets of the Wildrose site is its association with George Hearst, famed mining engineer and U. S. Senator, and father of the yet more famous William Randolph Hearst. Many writers have always associated Hearst with the Modoc Mine, usually stating or implying that he was the chief owner and operator.

The newspaper item, the only one encountered which mentions Hearst, makes it clear that he was an interested spectator in the smelting operation, but suggests nothing more than his frequent role as mine expert, paid handsomely for his advisory services. In the only George Hearst biography encountered, there is no mention whatever of his involvement with mining in Inyo County, but it made much of his expertise: "After Hearst organized and developed the Homestake Mine his footsteps in the western mining world led from Dakota to Cordillera. Often his assays of mines were quoted in schools of mines. He was considered the best judge of mines in the world. He was so much in demand, his judgement was so often sought, that he had scarcely any private life. From the time of his great success he belonged largely to his career. William Randolph Hearst recalled him as always going and coming with valises full of quartz specimens."

However, he did have an authentic interest in and at least an implied fractional ownership of the Modoc, for the California State Archives reveals George Hearst as one of the five directors of the Modock Consolidated Mining Company, the articles of which were filed on August 9, 1875, with principal place of business, San Francisco.

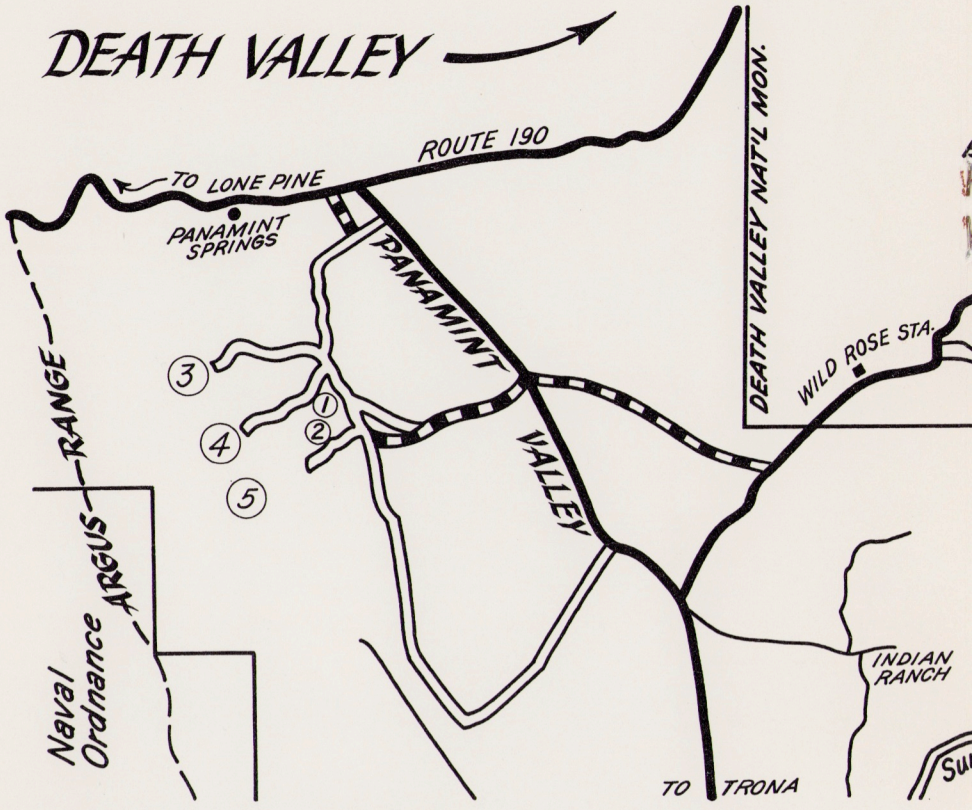
Another report from the *Coso Mining News* (November 1876) reflects the greatest optimism: "Modoc Village (Lookout) is assuming a most lively appearance, and its people feel sanguine of a bright and permanent future . . . . Already $100,000 have been taken out by the furnace process." The article describes the construction of a road connecting the Panamint Valley road with

the Modoc and Minnietta Mines and, for the first time in print, Wildrose Canyon is mentioned as the source for the charcoal consumed by the furnaces: ". . . . surveying parties have gone across Panamint Valley to bring in a road from Wildrose over which will be transported coal and timber supplies." Heretofore these products were probably packed by mules over rough trails.

The charcoal kilns in Wildrose Canyon were not yet built. The "coal" must have been made in primitive burning pits or in

The camp of Lookout was connected by pack trail with the neighboring mines of Minnietta and Modoc.

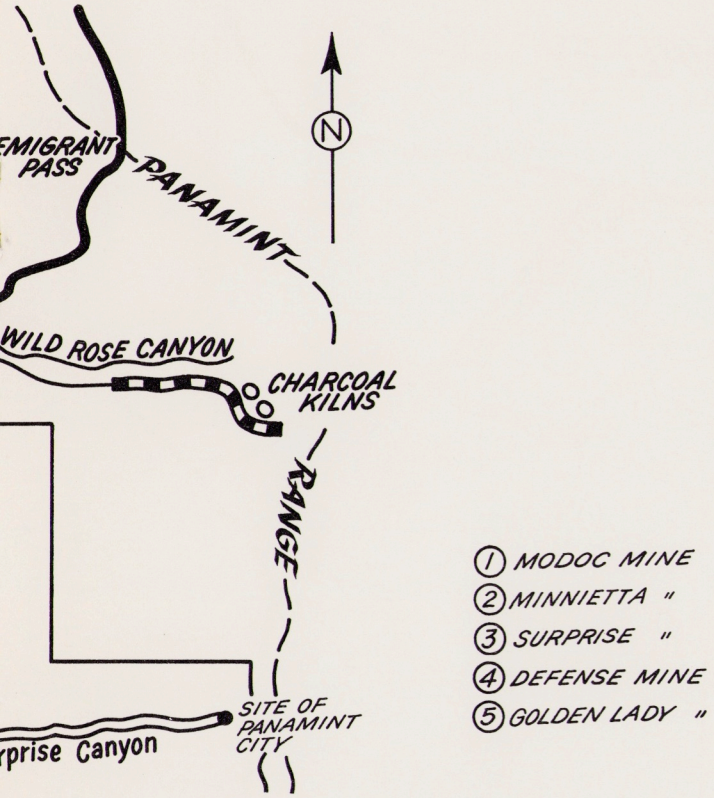
specially stacked piles of logs called "meilers". That a more efficient source of charcoal to feed the hungry smelter was essential can be gotten from this account printed in the *Inyo Independent* dated December 1876: "Not less than 500 mules and quite an army of packers, teamsters, coal burners, woodchoppers, etc. are constantly employed in furnishing coal and other local supplies. This and the freighting interests combined has built up a little town in Darwin Wash, which is said to be by odds the liveliest in the county. The furnaces are receiving no less than 3,000 bushels



of coal per day. The average out-put of one furnace since October 9, when it was first started up, is close on to 160 bars every 24 hours; a second furnace of the same capacity will soon be in constant operation, and then the daily yield will be over 300 bars, or about 13 tons of bullion . . . ." Much of the charcoal came from places other than Wildrose Canyon.

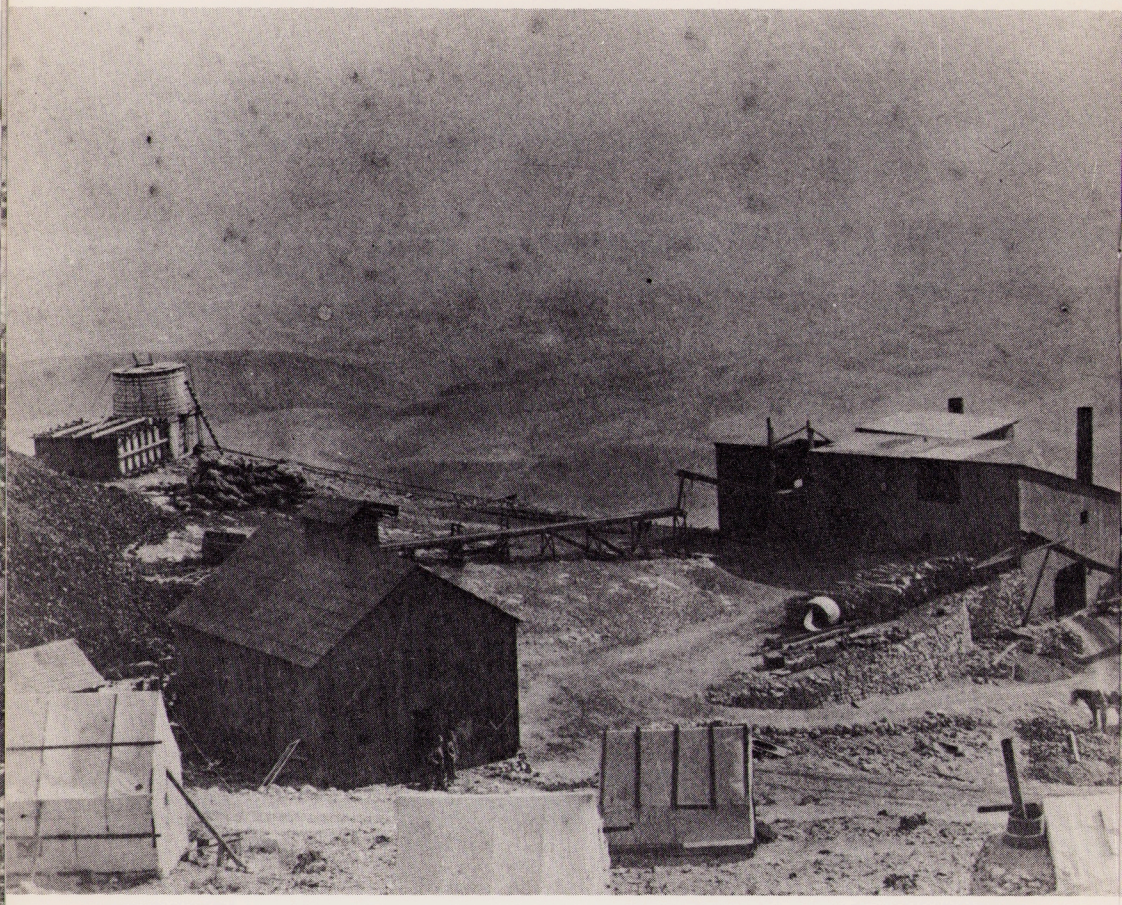
The effort to hurry the production and shipment of charcoal appears again in the January 27, 1877 issue of the *Coso Mining News* "The wood and coal road to Wildrose Canyon, from whence those supplies will hereafter be obtained, is now completed and in excellent condition. A tramway from the furnaces and mines to connect with the Wildrose road has been commenced, and machinery will be ordered immediately. It will be an iron double tracks cross-rail tramway, with a heavy stationary engine to propel the cars."

The first documented evidence of the Wildrose Kilns appeared in the May 19, 1877 issue of *Mining and Scientific Press.* It



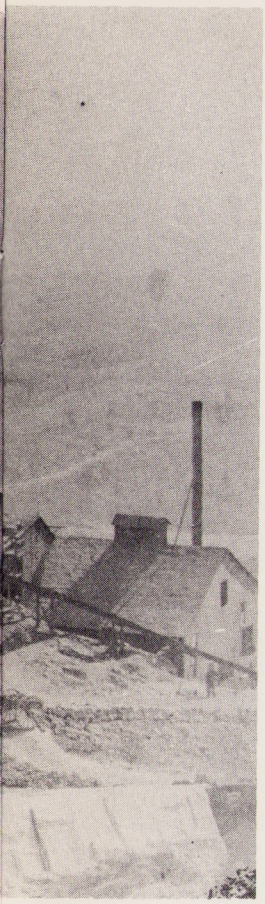
also suggests that earlier charcoal, at least that produced in Wildrose Canyon, was produced in pits. The location of one of these pits has been found in Wildrose Canyon, just this year, by Dr. William J. Wallace during an archeological investigation. The article reports: "Mr. Nadeau has a large force of men working on a new road from the Slate Range, up the valley, to the Minnietta and Modoc, connecting with the new road to the Wildrose wood and coal camp, where the Modock Company have a large force in the field. The new kilns, erected under the supervision of Mr. Morrison, are giving entire satisfaction, and are already furnishing a large amount of clean, hard coal, very much superior to that made in the ordinary pits." (Mr. Nadeau, of course, was Remi Nadeau, famous as pioneer road-builder and freighter in Panamint Valley. His most spectacular feat: the safe transport of the 750 pound balls of silver bullion from Panamint City to Mojave.)

Though previously published accounts of the Wildrose kilns ascribe their design to a Swiss engineer, construction by Chinese labor, and the firing of the kilns by local Shoshone Indians, these



so-called facts may be mere folklore. Because the work in Wildrose Canyon was reported to be under the supervision of Mr. Morrison, it is not unlikely that he, as supervisor of unskilled laborers, was also the designer of the kilns. As we will learn soon, the kilns must have been designed by an engineer or architect. Regrettably, historical research has failed to turn up anything more on Mr. Morrison.

The mortar binding the native stone from which the kilns were built had hardly set when crisis struck Modock Consolidated. In fact, two crises developed. The mining journals report a change in on-site managers (what we term today a "reorganization") perhaps because "this company has met with so much misfortune lately in their smelting operations." In the fall of 1877 the furnaces broke down, possibly because of the break-neck pace at which they were operating. On top of this came a crash in the price of lead. As you will recall, lead, in addition to silver and gold, was



The panorama across Panamint Valley to the Panamint Mountains was spread out before the Modock furnaces and mill located in the mining camp of Lookout.

an important product of the mines. The recession was accompanied by lay-offs and a drastic reduction in the wages of the remaining employees. Following that was a labor rebellion and another company "reorganization". (The worker's refusal to work for less than their usual $4 per day was good reason to rebel). The *Coso Mining News* sums up the situation quite well during the winter of 1877-78 by saying "times in Darwin are very dull."

Crises, as usual, quickly pass into history. By May 1878 the mines were operating again. The May 11 issue of the *Coso Mining News* again mentions the kilns at Wildrose and suggests that the charcoal burning operation was not affected by the economic turndown: "Both furnaces are now running to perfection and turning

out 200 bars of bullion every 24 hours, the bars weighing an average of 85 pounds each. Thirty-eight tons of ore are running through each 24 hours. The fact that there were 50,000 bushels at the kilns in Wildrose Canyon, and the further fact that Mr. Guptill (the new mine superintendent) has put a force of men at work to run the ten kilns, of 42 cords capacity each, and to burn also in pits, and is also purchasing coal from this side of the mountains as well, is pretty good evidence that the Modoc furnaces will run for a long time."

This optimism didn't last long. Records of activity at the Modoc mines are very sketchy after this time and the charcoal kilns are not mentioned again. It is known, however, that the San Francisco owners leased that entire mining property in 1881 to another operator, Frank Fitzgerald. It was also reported in 1883 the mines had been operating at a loss by the owners.

National Park Service research historian Merrill J. Mattes, in his definitive study of the Charcoal Kilns writes: "The 1890 *Report of the State Mineralogist* brings out the fact that there are three smelters in this district, but they have not been run for several years. The ores of high grade that are extracted here are treated abroad, giving better financial results than if treated at home. From this may be clearly inferred that the famous smelters were abandoned about 1885. It can only be inferred also that this would have been the latest possible date for the production of charcoal at the Wildrose kilns. However, it is probable that charcoal manufacture at Wildrose ceased long before this date."

It is most likely that the fires of the kilns were cooled in 1879. Scientists at the University of Arizona Laboratory of Tree-Ring Research visited the Wildrose area in 1961 to conduct growth-ring studies. They carefully examined the stumps of 28 pinyon pines. In addition to setting up a tree-ring chronology for the Panamint Mountains, their 1962 technical paper concluded "Cutting in the period 1876-1879 is indicated by tree-ring dating for 26 trees presumed to have been utilized as material for the nearby Charcoal Kilns." Thus the record preserved in the now dead trees ties in well with the written record of men about events which occurred nearly 100 years ago!

Through these years of disuse and neglect, time, the elements, and vandalism took their toll on these remarkable Wildrose Kilns. In the early days of Death Valley National Monument, in the dark days of the nation's severest depression, boys of the Civilian Conservation Corps (the old CCC) worked out of camps located

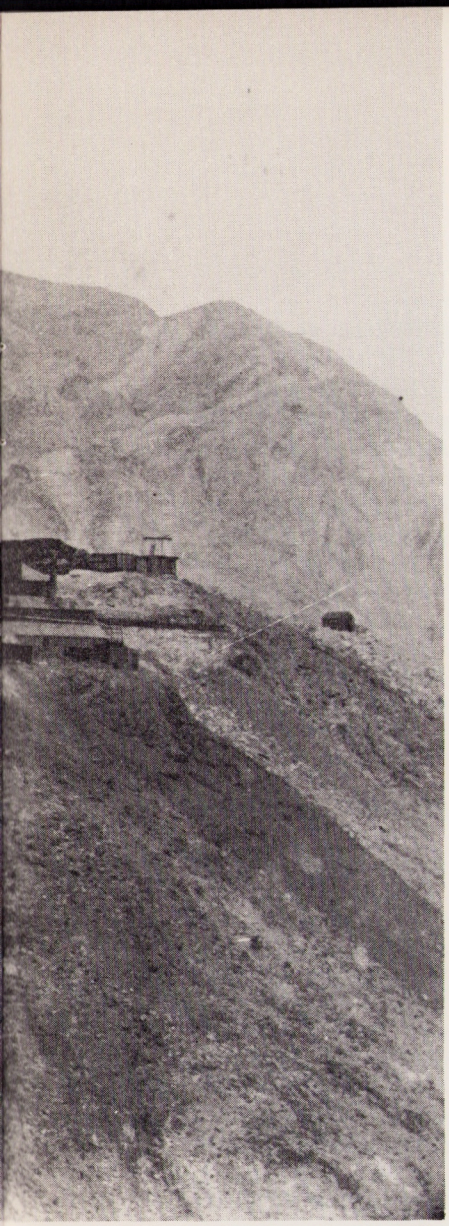
The diameters of the Wildrose charcoal kilns vary from 30 feet 4 inches to 32 feet 6 inches. The average height of each is 25 feet 6 inches. The walls are 24 to 26 inches thick at the base but narrow to about 12 inches toward the top.

at Furnace Creek and Wildrose. They made the first repairs by patching several gaping holes blasted in several kilns. Since the 1930s little was done until recently.

Early in 1970 the Wildrose kilns were measured and described by historians and historical architects as a part of the National Park Service's historic structures preservation program. A stabilization and restoration plan was also drawn up.

When snow was still falling in the Panamints in the spring of 1971, a team of expert ruins stabilization men—all Arizona Navajos, erected scaffolds and put the plan in motion. They swarm-

ed like bees over the hive-shaped ovens rejointing loose rocks, replacing others which had already fallen, and matching carefully the color of the original mortar. They restored the kilns. Their work was hampered by storms which battered the mountains more frequently than usual this year. Five times during the month they labored here, they went out in the gales to cover a kiln to prevent the freshly brushed mortar from freezing. We believe they did an amazing job. But decide for yourselves. As you look at the kilns today and compare them with the way they looked last year, we doubt you can notice the difference. That's good restoration!



The Modock furnaces dominated the scene in the town of Lookout which was perched high on the mountain in the Argus Range.

When you revisit the kilns during your stay in Death Valley, and I invite you to do so, examine carefully the manner in which the beehive ovens were built.

The first thing that strikes the eye is that all ten kilns are in perfect alignment and that all are the same size and shape. The diameters vary from 30 feet 4 inches to 32 feet 6 inches. The average height of each is 25 feet 6 inches. All these measurements are so close that the differences are not visible without a tape measure in hand. A more careful examination reveals some significant differences.

Look at the walls carefully and note their thickness at the base, then at the top. You will note that the walls are 24 to 26 inches thick at the base but narrow to about 12 inches toward the top, forming two parabolic curves one inside the other. Now, the parabola or parabolic curve is a precise mathematical figure which has some startling properties. This form is most frequently seen in lighting fixtures, especially floodlight reflectors. Huge parabolas are the radiotelescope antennas, such as the cluster located in Owens Valley, which focus unbelieveably faint bursts of radiation from the far reaches of outer space.

A parabolic surface, like the arch, is a strong structure. A parabola's ability to focus waves, whether radio, light, heat or sound waves is its most useful feature. What better form is there to contain heat—*even* heat—required in the making of quality smelter charcoal?

When you visit the kilns, I invite you to enter one of the ovens through the front door. Walk to the center of the kiln and stand there. Speak a few words. Then ask someone else to enter and stand along the inner wall and utter a sound. Then trade places and repeat the demonstration. The wave-concentrating properties of a parabola and, perhaps, the true engineering marvel of these historical structures, will become self-evident.

As you explore the charcoal kilns you will notice the upper vents or "windows." Some are lined with native stone; others with clay brick. Notice, too, the three rows of 4-inch square air vents which perforate the lower walls all the way around. The air within each kiln is still pungent with the odor of resin and creosote, the by-products of the burning process. Here is a place which stimulates the senses—all of them. Try it and see. To return to Wildrose Canyon is to whisk back in time, to a time when the country was untamed and lives were unprogrammed, to a time when food didn't come in frozen packages, and when a trip to town was a journey.

The Wildrose Charcoal Kilns stand as outstanding examples of industrial architecture. In fact they are among the last remains of the once vital charcoal industry itself at a time when charcoal-making was an art. More important, the row of ten beehive ovens stand as reminders—monuments really—to that second wave of pioneers to our desert country. Let's hope they stand for a long time to come.

HOW WAS CHARCOAL MADE?

The making of charcoal is a very simple process and an ancient one. Wood can be converted to charcoal by heating it in the absence of air until it becomes charred. The final product will be a form of carbon about 96 percent pure. The process is called destructive distillation.

If you are willing to smell up the house, charcoal can be made easily in the kitchen. Perhaps you may wish to try it when you return home. Gather a few pieces of wood, wet or dry, and place them in an empty coffee can, one that has a metal lid. Punch a small hole in the center of the lid and reseal the can so the lid fits tightly. Place your charcoal kiln or distilling retort on the kitchen range and apply medium heat.

After a while you will begin to smell the acrid odors of the decomposing wood. The smell of creosote will prevail. Substances in the wood will be converted to gases, which will burn with a bluish flame if a match is held to the vent hole in the can. Continue the flame testing every half hour or so. When the flame no longer burns let the can cool and your charcoal is ready. As you open the can you will notice the insides are coated with a tarry substance. This goo is the non-gaseous remains of the components of the wood. After 94 years an identical residue still clings to the walls and has impregnated the floors of the Wildrose charcoal kilns.

Except for the larger scale of operation, the same process was employed in the operation of the beehive kilns. Woodcutters felled pinyon pines on the mountain slopes in Wildrose Canyon and in other canyons to the south. Logs were cut in four foot sections and stacked along a road or trail. Packers loaded the cut logs onto crude sleds and hauled the piles to the kilns. The charging and firing of the kilns undoubtedly was carried out in an almost ritualistic procedure, for the process, as mentioned, was an ancient one. Like most skilled trades, the knowledge of the craft was handed down from father to son.

Let the words from Dr. Egleston's paper, presented to a congress of mining engineers in 1879, describe how charcoal was made!

"It is generally agreed that kilns give a better yield than meilers . . ."(Meilers, you will recall, are piles of carefully stacked wood placed in pits or free-standing on the ground and covered with soil to make them burn slowly.) "The amount of labor in using the kiln is also less . . . The yield of charcoal is also greater in the

kiln than in the meiler, it being from 45 to 50 bushels to the cord in the kiln, and from 30 to 35 bushels in the meiler . . .Besides this, the kiln is always under complete control, and can be examined by the burner at any time, and the exact condition of every part of it can be ascertained at every step in the process. As there is only an approximate knowledge and control of the meiler, the kiln should give the best product . . . In the desire to have but few structures to take care of, and to have the largest possible furnace capacity with the least expense, the kilns have been made too large. Experience has shown, however, that it is more economical to use kilns of small capacity, and that the increase in the cost of the structures is more than compensated by the increase in the quality of the product; while within large kilns the diminished costs of the plant is dearly purchased at the expense of a dimished yield of coal, and by the relatively poor quality of the product." In speaking of the advantages of kilns over meilers, Dr. Egleston said, "The yield is at least from 15 to 20 percent more, and the expense is at least one-third less."

"As there are many silver districts in the West", he added, "where coke cannot be had at such a price as will allow of its being used, and where the ores are of such a nature that wood cannot be used in a reverberatory furnace, the most economical method of making charcoal is an important question.

"Kilns for the manufacture of charcoal are made of almost any shape and size, determined in most cases by the fancy of the builder, or by the necessities of the shape of the ground selected. They do not differ from each other in any principle of manufacture, nor does there seem to be any appreciable difference in the quality of the fuel they produce, when the process is conducted with equal care in the different varieties; but there is a considerable difference in the yield and in the cost of the process in favor of small over large kilns. The different varieties have come into and gone out of use mainly on account of the cost of construction and of repairs. The object of a kiln is to replace the cover of a meiler by a permanent structure."

Professor Egleston continued, "The kilns which are used may be divided into the rectangular, the round, and the conical, but the first two seem to be disappearing before the last, which is as readily built and much more easily managed." I'll comment a bit later on the reasons why the conical shaped kiln is so much easier to work with.

In fact, the Wildrose kilns are even more sophisticated in design than the conical shape that Dr. Egleston now describes. "The conical kilns are generally smaller than either of the varieties. They are usually from twenty to twenty-five feet high, and from twenty-five to thirty feet in diameter, and are intended for twenty-five to forty-five cords of wood. They are constructed in such a way as to require no bracing of any kind. They are often built into the side of a bank, a part of the earth of which is removed so as to make

a charging-door near the top on a level with the ground; or they may be built on a plain, in which case there is no upper door, but only a charging hole at the top, which is reached by a ladder in order to close it."

Though describing the charging and firing of kilns of the period in New York state, the good doctor could well have been describing the operation of our kilns. He goes on, "To charge the kiln, skids two inches in diameter are laid three feet apart, keeping the ends up to the outside. They must be placed in the radii of the circle, for if the smoke is at all confined it will cause an explosion. The wood used is cut 4 feet eight inches long, and is of all sizes from four inches up to two feet in diameter.

"A fireplace, or chimney, four feet square, is made in the center of the kiln, and carefully preserved in the filling to the top. An air-channel is made from it to the opening in the lower door. This is filled with shavings, brands, and lightwood, thrown in loose, which when the kiln is lighted is fired with a long pole from the door.

"It takes four men about twelve hours to fill the kilns. When the kiln is ready to light, the upper door is closed and luted,* but the lower one is left open until the kiln is lighted. Bricks are placed loosely in all the vent-holes; sufficient air comes in around them to light the wood. The fire is lighted with a torch through the channel prepared for the purpose. Four vents on each side of the door are then closed and luted; the others are closed as it is necessary, with a loose brick. The firing is always done at night. At the end of thirty-six hours a little air is let in by the vents near the door. The operation is conducted by means of the vents, which are carefully watched. The smoke will be white from three to four days. It will then become yellow in from twelve to thirty-six hours, and then will be blue for about twelve hours. When the smoke is blue at the top vent, it is allowed to remain open for twelve hours, and is then closed. In another twelve hours the second row will blue up, when that is closed. The bricks are finally drawn out of the lower vents; the fire then comes to the bottom, and when ready they are closed.

"If the smoke is pale and in small quanity at the commencement the vents must be opened. When it is burning well the smoke is quite like steam. It takes from six to eight days to burn a 35-cord kiln. All the openings in the kiln are then carefully closed and luted. After it has stood 2½ to three days, eight to ten barrels of water are thrown into the top openings, or through the vents, and the next day the charcoal can generally be drawn. It will take five days to cool without watering, and three if water is used. It is necessary before drawing that the fire should be perfectly extinguished. To be certain that the fire is quite out, the charging door or vent-holes are sometimes opened for an hour or two. If there is no increase in the temperature of the air the kiln may be discharged."

*lute—a substance (as cement or clay) for packing a joint or coating a porous surface to make it impervious to gas or liquid.

DEATH VALLEY 49ers OFFICERS 1972

Dean Lemon	Glendale	President
William H. Newbro	Burbank	1st Vice-President
Palmer L. Long	Anaheim	2nd Vice-President
R. Chalmers Graham	Pasadena	Treasurer
Jack Stoddard	Los Angeles	Secretary
Paul DeDecker	Independence	Immed. Past President
John Anson Ford	Los Angeles	President Emeritus

DIRECTORS

Paul D. Bailey, Thomas H. Baskin, Bill Bender, Capt. Chas. Blenman, Howard T. Chuman, Dr. Thomas Clements, Richard D. Crowe, Cy DeLashmutt, Ross C. Dorsett, Ralph A. Fear, Capt. R. A. Gibson, Arthur B. Groos, Mrs. Hazel Henderson, Dick Hilleary, Eugene R. Hoffman, H. Harold Ihrig, George Jansen, Russell M. Johnson, Edward P. Jones, George Koenig, Mrs. Willard J. Lewis, Robert Logsdon, Tom H. Mathew, Don Meadows, Leo S. Moore, J. Emil Morhardt, Elmore Nelson, Ralph L. Oertell, John C. Padgett, Sid Platford, Trevor S. Povah, Bill Robinson, Fred Richards, Merrill D. Sipherd, George Sturtevant, Hugh C. Tolford, Don Torguson, Robert Wagoner, Ardis M. Walker, Charles P. Ward, Merle E. Wilson.

HONORARY DIRECTORS

Horace Albright, Ruben S. Ayala, L. Burr Belden, Carl C. Cowles, John W. Hilton, Alex C. Krater, Willard J. Lewis, John H. Lubken, Robert Murphy, Mathew Ryan, Leslie W. Scott, G. Henry Stetson.

ADVISORY COMMITTEE

Katherine L. Ainsworth, N. Curtis Armstrong, Spencer Austrian, Clifford W. Banks, Gene Barilotti, Sybil Belden, Sheriff Frank Bland, Mrs. Irene Broadbent, Judge Alan Campbell, Kenneth A. Campbell, Willie Capucci, Lydia Clements, Jerry Compton, Mary DeDecker, Carl S. Dentzel, Supv. Robert R. Fisher, Richard J. Flood, Dick Goodman, Wm. B. Grantham, John E. Graves, Evelyne B. Grierson, Paul Gruendyke, Sgt. Ray Hailey, David Halbach, Richard B. Hoegh, Supv. Jack Hopkins, Marvin E. Jessey, Douglas Joseph, Bill A. Kelsey, Joe Lehman, Tad Lonergan, M.D., Joseph J. Micciche, Supv. D. D. Mikelsell, Ron D. Miller, Les Montgomery, Joan Newbro, David Packwood, William Peterson, Terry Povah, Don Richardson, Supv. Walter W. Rollins, Mrs. George W. Savage, Glenn A. Settle, James H. Smith, Bernice Sorrells, Herschel J. Stiffler, John W. Stratton, Ray Swanson, Tugs Swenson, Virgil Swoboda, Brian T. Thompson, Harold E. Thompson, W. L. Thompson, M.D., Fred Webster, Peter B. Westnedge, Walt Wheelock, Ruth Woodham.

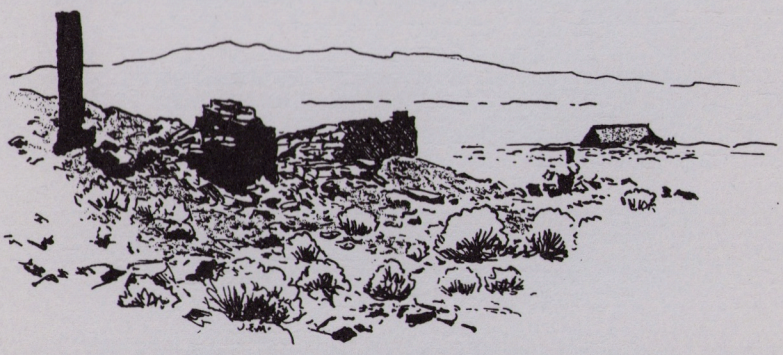
Photos: 2, 4, 8, 17: By Edward Jones
6, 10, 14, 18: Collection of George Sturtevant
5, Back Cover: Collection of Russ Johnson

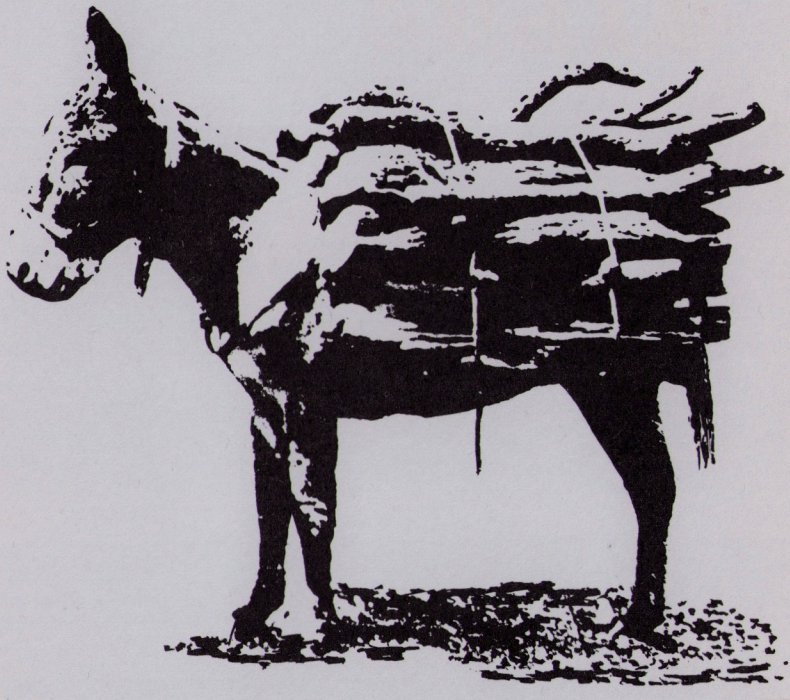
BOOK DESIGN: Russ Johnson

Printed by
Chalfant Press, Inc.
Box 787, Bishop, California 93514

DEATH VALLEY '49ers PUBLICATIONS

1. **GEOLOGICAL STORY OF DEATH VALLEY**
   By Dr. Thomas Clements
2. **SYMBOLS OF DESTINY—THE DEATH VALLEY HEROISM OF W.L. MANLY**
   By Ardis Manly Walker
3. **DEATH VALLEY TALES**
   By Ten Western Authors
4. **GOODBYE, DEATH VALLEY!**
   By L. Burr Belden
5. **A NATURALIST'S DEATH VALLEY**
   By Dr. Edmund C. Yeager
6. **CAMELS AND SURVEYORS IN DEATH VALLEY**
   By Arthur Woodward
7. **FIFTY YEARS IN DEATH VALLEY**
   By Harry P. Gower
8. **RECORD—"SAGEBRUSH TRAILS"**
   Recording of desert songs by J. Emil Morhardt
9. **THE DEATH VALLEY '49ERS COOK BOOK**
   Compiled from Death Valley '49ers heirloom recipes edited by Lydia Clements





I 643
$2 00